ASSESSMENT OF MICROBES PRESENT IN GROUNDWATER OF CUDDALORE DISTRICT, TAMIL NADU.

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ABSTRACT

The purpose of this study is to evaluate the presence of microbes on groundwater of Cuddalore District. Groundwater is slowly contaminated by sewages, agricultural and urban runoff. Domestic waste waters are widely discharged to water bodies, particularly rivers. Pathogens related with these discharges consequently become distributed through the water body presenting a risk to downstream water users. Usually municipal raw sewage can contain 10 to 100 million coliform bacteria 100/ml and 1 to 50 million Escherichia coli or faecal streptococci 100/ml. Different levels of wastewater treatment may reduce this by a factor concentrations are reduced further after dilution by the receiving waters. Microbes such as coliforms, streptococci, presence on groundwater were analyzed by using most probable number (MPN) and compared with water quality standard of World Health Organization (WHO).

KEYWORDS: Domestic waste, water, Sewage, Groundwater, Water body and Microbes.

INTRODUCTION

Ground water is considered as a safe source of fresh potable water.[1] Whose quality can be influenced directly and indirectly by microbiological processes, it can transform both inorganic and organic constituents of ground water. These biological transformations usually have ten geochemical processes.[2] Ground water is ultimate and most suitable fresh water resource with nearly balanced concentration of the salts for human consumption.[3] Single and multi-celled organisms have become adapted to using the dissolved material and suspended solids in the water and solid matter in the aquifer in their metabolism and then releasing the metabolic products back into the water. There is practically non geological environment at, or

near the earth's surface where the pH and Eh conditions will not support some form of organic life.[4] In addition to groups tolerating extremes of pH and Eh, there are groups of microbes which prefer low temperatures (psychrophiles), others which prefer high temperature (thermophiles) and yet others which are tolerant of high pressures. However, the most biologically favorable environments generally occur in warm, humid conditions. Total coliform bacteria are naturally present in the environment and in general are harmless to people. However, some coliforms may cause illness in humans and the presence of coliforms is an indication that other micro-organisms may be present. Coliforms are found in human and animal wastes and when present, indicate contamination. Drinking water that contains coliform bacteria increases the risk of becoming ill. Well owners should not drink water with coliform in it.

MATERIALS AND METHODS

There are twenty four sampling stations were chosen, for the present investigations i.e.) four from six taluks of Cuddalore District (TN) were selected. Water samples were collected in two polyethylene bottles of one liter capacity from different locations of the District. The samples were collected from hand pump without any air bubbles. But 100 ml of water sample was used to analyze the Presence of Microbes such as coliforms, Streptococci and Total visible count were analyzed using most probable number (MPN) of bacteria present can then be estimated from the number of tubes inoculated and the number of positive tubes obtained in the confirmatory test. Using specially devised statistical tables. This technique is known as the MPN method.

Bacteriological analysis

Bacterial populations from water samples were analyzed by the pure culture technique (spread plating method) on specific selective medium (TVC – Nutrient agar; TC – MacConkey agar; TS – M-Enterococcus agar) plates with 100 µl of suitable serial dilutions. The media plates were incubated at $37 \pm 1°C$ for 24 to 48 h and the final counts of colonies were noted. All the culture media were obtained from Hi-Media Pvt. Ltd., Bombay, India.

Site description

Cuddalore District is situated at Northern region of Tamil Nadu state lying between latitude $11^043'$ to $12^030'$ North and longitude $79^049'$ to 80^0east. The sampling locations in Cuddalore District for appraisal of heavy metal contents of ground water are given in Table- 1.

Table 1: Name of the stations Used for Water Sampling.

Virudhachalam (Tk)	Tittakudi (Tk)	Kattumanarkoil (Tk)	Chidambaram (Tk)	Cuddalore (Tk)	Panrutti (Tk)
V_1-Mangalampet	T_1- Pennadam	K_1-Kattumanarkoil	C_1-Nanjiyour	D_1 -Cuddalore	P_1-Nellikuppam
V_2-Virudhachalam	T_2-Avinangudi	K_2-Srimusnam	C_2-Chidambaram	D_2 –Mettoor	P_2 –Pattampakkam
V_3-Neiveli	T_3-Tittakudi	K_3 –Soladharam	C_3 -C.Mutloor	D_3- Semmankuppam (Sipcot)	P_3 –Panrutti
V_4- Karuveppilankurichi	T_4-Keelseruvai	K_4 –Lalpet	C_4 -B.Mutloor	D_4- Semmankuppam (Village)	P_4 -Sanmar, Pvt, Ltd. (Kadaampuliyur)

Bacteria count

Bacteria can be able to count by: (i) the growth of colonies directly on a suitable medium, (ii) the increase in turbidity in an aquatic medium, (iii) the growth of colonies on a filter and medium, (iv) the evolution of gas after incubation in a special growth medium. By careful selection of the medium, an inhibitor, or a marker for specific metabolic products it is possible to enumerate specific group of bacteria (or) all kinds of bacteria. The technique selection depends on the organisms of interest, the nature of the water sample and the availability of equipment and skilled help. For comparability over time, however it is essential that the chosen method is always adhered to.

RESULTS AND DISCUSSION

Coliform bacteria

The microbial analysis of the water samples showed that bacterial colonies found from 4.1×10^2 to 28×10^2 CFU/ml. From the analysis all the sample exceeds the acceptable limit. In general high level of free CO_2 might be the cause for low pH values obtained in the groundwater samples, therefore which may affect the bacterial counts. Groundwater are found to be infected due to improper edifice shallowness, animal wastes, proximity to toilet facilities, manure, refuse dump sites and various human activities around the bore well. Counts of total coliform is (CFU/100 ml) compared to the Egyptian standards of acceptability for potable water. The principle values for total coliform are 100/ml. According to Egyptian standard for Total Visible Bacteria (TVB) are 50 CFU/ml and according to WHO standard 100 CFU/ml.[5]

*CFU: Coliform unit.

Streptococci

When other coliform organisms are found not including the presence of faecal coliforms and Escherichia coli, when additional indicator is used, the presence of faecal contamination is confirmed. The two most common indicators for faecal streptococci are the sulphite-

reducing, Clostridia perfringens. Faecal streptococci rarely increase in polluted water and are more opposing to disinfection than coliform organisms. Clostridial spores are also able to stay alive in water longer than coliform organisms and resist disinfection when inadequately carried out. They are not suitable organisms for routine monitoring because their resistance enable them to survive for long period and they can be transport long distances after the initial infection. Multiple tube and membrane filtration technique can be used to reduce growth conditions.[6]

Streptococcus is the most common cause of staph infections. It is a spherical bacterium, frequently found in the nose and skin of a person. S. aureus can cause a range of illnesses from minor skin infections, such as pimples, impetigo, boils, cellulitis folliculitis, furuncles, carbuncles, scalded skin syndrome and abscesses, to life-threatening diseases such as pneumonia, meningitis, osteomyelitis, endocarditis, toxic shock syndrome and septicaemia. Its incidence is from skin, soft tissue, respiratory, bone, joint, endovascular to wound infections.[7] Streptococcus found from 0.3×10^2 to 3.0×10^2 CFU/ml. There is no prescribed limit for Streptococci.[5]

Total viable count

It is the technique to enumerate the heterotrophic bacteria.[8] Total viable counts of colonies were found from 9.4×10^3 to 55×10^3 CFU/ml. From the analysis all the sample exceeds the acceptable limits 100 CFU/100ml by WHO.[5]

Statistical analysis

Interrelationship studies between different variables are very helpful tools in promoting research and opening new frontiers of knowledge. The study of Standard deviation reduces the range of uncertainty associated with decision making. The Standard deviation (σ) was calculated using the equation.

Calculation

$$\sigma = \frac{\sqrt{\sum x^2}}{N - (\sum \frac{x}{N})^2}$$

Where, $\sum X$ = represents sum of variables, N = Number of total observations. The numerical values of N=24, Parameters are tabulated in Table-2.

Percentage

Percentage may be calculated with the sum of data divided by N, The numerical values of N=24.

Table -2 Percentage of Microbes presence with Standard Deviation.

| Microbes	Minimum (CFU/ml)	Maximum (CFU/ml)	Average (CFU/ml)	Median (CFU/ml)	Mode (CFU/ml)	Standard Deviation (CFU/ml)	Percentage per100ml
Coliforms	4.1	28	11.97083	9.8	18	7.300713	11.97
Streptococci	0.3	3.0	1.554167	1.6	1.9	0.707094	1.55
Total viable count	9.4	55	22.27083	19.4	21	11.56157	22.27
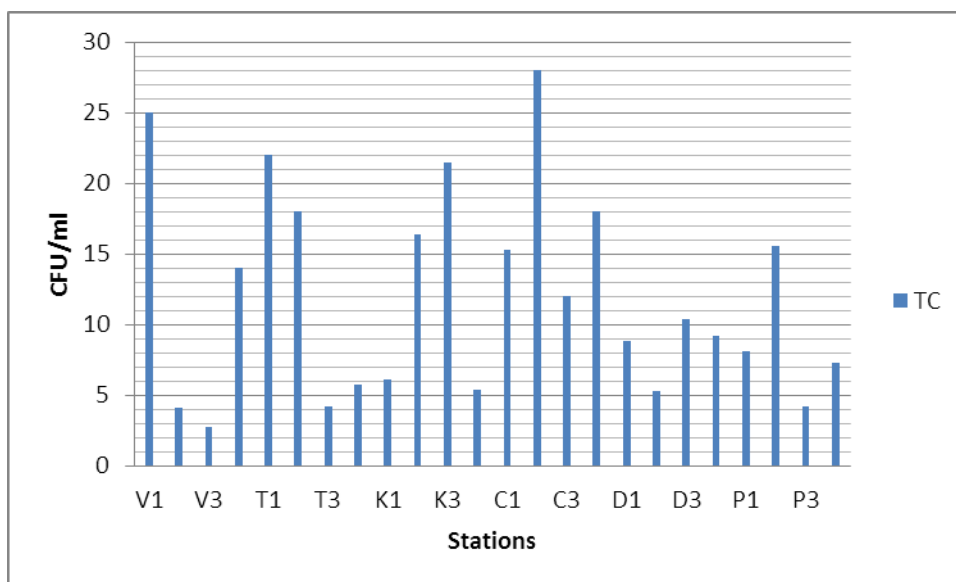
Graph: 1 Graphical Representation of Total coliforms.

Note: CFU = Coli Form Unit
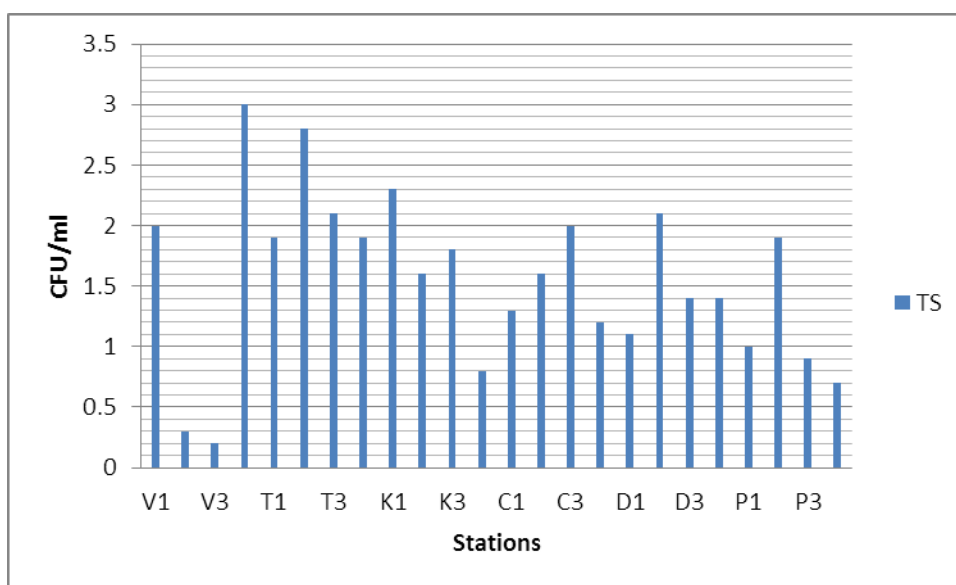
Graph: 2 Graphical Representation of Total Streptococci.
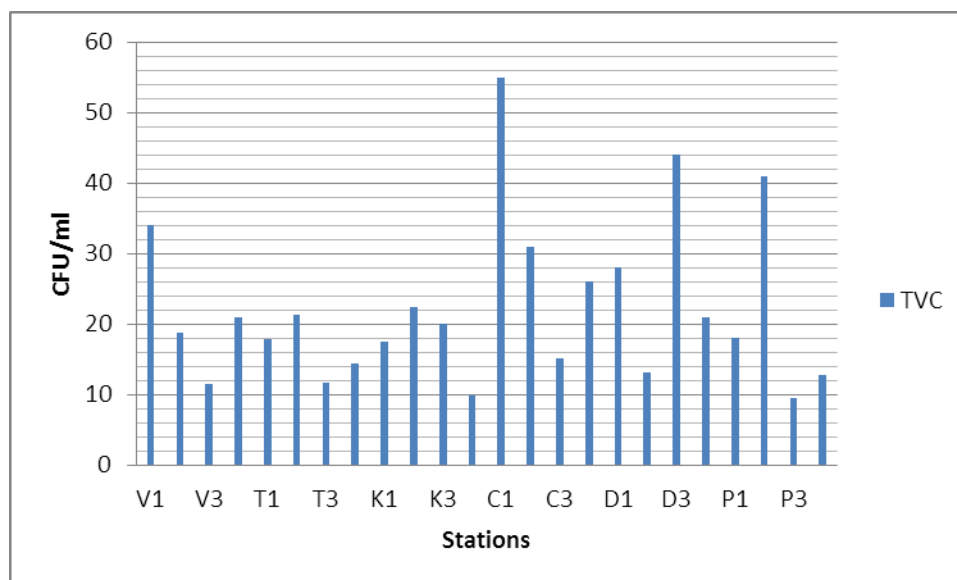
Graph: 3 Graphical Representation of Total viable count.

CONCLUSION

Water is the valuable natural resources which is facing depletion and pollution due to increase in consumption by ever growing population and industrial activities. This calls for active need for water management which requires water quality analysis as the initial step. Water quality standards vary significantly due to different environmental conditions.

The study assessed the groundwater quality of the investigated area of Cuddalore district, with microbes such as coliforms, Streptococci and total visible count were not found higher than the prescribed limit. Groundwater quality of the investigated area was not yet polluted highly but samples from Virudhachalam and Cuddalore taluks shows somewhat high there should be a regular monitoring is essential, if not which may causes any health impact on living organisms. There must be an increasing awareness among the people to maintain the groundwater purity is also required.

REFERENCES

1. Ahamed Sulthan J, Mohamed Sihabudeen M, Sirajudeen J, Asrar Ahamed A. Physicochemical Characteristics of Groundwater of Cuddalore District, Tamil Nadu, South India. Journal of Chemistry and Chemical Sciences, Oct 2015; 5(10): 542-549.
2. Chapelle. F H, Ground Water Microbiology and Geochemistry, 1st Edition, John Wiley, New York, 1993.
3. Ahamed Sulthan J, Mohamed Sihabudeen M, Sirajudeen J, Asrar Ahamed A.Variation in Physicochemical Characteristics of Groundwater Quality between taluks of Cuddalore

District, Tamil Nadu. International Journal of Recent Scientific Research, 2016; 7(5): 11118-11122.

4. Chilton PJ, West JM. Aquifers as environments for microbial activity. Proceedings of the International Symposium on Environmental Aspects of' Pesticide Microbiology, Sigtuna, Sweden, 1992; 293-304.

5. Ahmed M. Abdel-Azeem, Tamer S. Abdel-Moneim, Mohsen E. Ibrahim, Mamdouh Y. Saleh, Shrief Y. Saleh And Abdel-Moneim O. Abdel-Moneim, Microbiological and Physicochemical Analysis of Groundwater and its Biological Effect on Population in Saint Katherine Protectorate, Egypt, 2009; 1491-1513.

6. Friedrich. G, Chapman. D, Beim. A. Water quality assessments – A guide to use of biota, sediments and water in environmental monitoring Second Edition Edited By Deborah Chapman, UNESCO/WHO/ UNEP, ISBN-0 419 21590 5 (Hb), 1996.

7. Kumar. A, Rawat. S, Srivastava. M, Bhushan. V. Physicochemical analysis and isolation of bacteria from water samples of Maharana pratap Sagar, Kangra district of Himachal Pradesh, 2012; 7(3): 161-166.

8. Maheepal Singh. Correlative study of Physicochemical and Microbiological parameters of radha and shyam kund govardhan, Mathura (U.P), The Experiment, 2014; 25(3): 1726-1735.

9. Rajiv P, Hasna Abdul Salam, Kamaraj M, Rajeshwari Sivaraj, Balaji R. Comparative Physicochemical and microbial analysis of various pond waters in Coimbatore district, Tamil Nadu, India, ISSN 0976-1233, 2012.